

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (currently amended): A retainer for rolling bearings comprising:
a rolling element receiving pocket for receiving a rolling element, said pocket being formed by finish-machining a blank pocket with a milling tool member while a machining part of said tool member is inserted into said blank pocket in a radial direction of said retainer and then translated in an axial and revolving directions of said retainer,
wherein said machining part of said tool member has a sectional contour which coincides with a sectional configuration of said pocket in a cross section taken along the radial direction of said retainer after the formation of said pocket is completed,
wherein said rolling element is a roller,
said pocket is defined by a pair of ring-shaped side plates and a pair of pillars each having end portions which are respectively connected to said ring-shaped side plates,
a first pocket surface is formed on each of said pillars and a second pocket surface is formed on each of said ring-shaped side plates, wherein one of said pillars has a chamfer portion provided thereon at a boundary between said one of said pillars and either an outside or inside diameter surface of the retainer,
said first pocket surface is formed in an arc-shaped configuration in a cross section along the radial direction of said retainer, ~~and~~
wherein roller run-out preventing portions are formed at end portions of said pillars in the radial direction of said retainer, the width of said pocket in the revolving direction of the retainer is made smaller than the diameter of said roller, said width being defined between adjacent roller run-out preventing portions and formed at an end thereof in the radial direction of said retainer,

wherein said first pocket surface faces toward the revolving direction of said retainer, and said second pocket surface faces toward the axial direction of said retainer and an escaping recess is disposed between said first and second pocket surfaces,

wherein said tool member comprises a first tool for finish-machining said first pocket surface and a second tool for finish-machining said second pocket surface and said escape recess,
and

wherein a surface of the escaping recess is arc-shaped when viewed from the radial direction of the retainer.

2-3. (canceled).

4. (currently amended): The retainer for rolling bearings as set forth in Claim 12, wherein end portions of said run-out preventing portion in the axial direction of said retainer are separated from one of said side plates by escaping recesses.

5. (currently amended): A retainer for rolling bearings comprising:

a rolling element receiving pocket for receiving a rolling element, said pocket being formed by finish-machining a blank pocket with a milling tool member while a machining part of said tool member is inserted into said blank pocket in a radial direction of said retainer and then translated in an axial and revolving directions of said retainer,

wherein said machining part of said tool member has a sectional contour which coincides with a sectional configuration of said pocket in a cross section taken along the radial direction of said retainer after the formation of said pocket is completed,

wherein said pocket comprises a first pocket surface facing toward the revolving direction of said retainer, a second pocket surface facing toward the axial direction of said retainer and an escaping recess disposed between said first and second pocket surfaces, and wherein said tool member comprises a first tool for finish-machining said first pocket surface and a second tool for finish-machining said second pocket surface and said escaping recess,

wherein said rolling element is a roller,
said pocket is defined by a pair of ring-shaped side plates and a pair of pillars each having end portions which are respectively connected to said ring-shaped side plates,
a first pocket surface is formed on each of said pillars and a second pocket surface is formed on each of said ring-shaped side plates,
said first pocket surface is formed in an arc-shaped configuration in a cross section along the radial direction of said retainer, and
wherein roller run-out preventing portions are formed at end portions of said pillars in the radial direction of said retainer, the width of said pocket in the revolving direction of the retainer is made smaller than the diameter of said roller, said width being defined between adjacent roller run-out preventing portions and formed at an end thereof in the radial direction of said retainer, and
wherein a sectional configuration of said run-out preventing portion along the radial direction of the retainer on the pillar side is formed into a curved line smoothly connecting to said first pocket surface and having a radius of curvature protruding toward said pocket, and
wherein a surface of the escaping recess is arc-shaped when viewed from the radial direction of the retainer.

6. (canceled).

7. (currently amended): A retainer for a roller bearing comprising:
a pair of ring-shaped side plates;
a plurality of pillars arranged in a retainer revolving direction and each having end portions respectively connected to said ring-shaped side plates, wherein one of said pillars has a chamfer portion provided thereon at a boundary between said one of said pillars and either an outside or inside diameter surface of the retainer,;
a roller receiving pocket defined by said ring-shaped side plates and adjacent pillars of said pillars for receiving a roller,

wherein pocket surfaces are formed on sides of said pillars and side plates by machining with a milling tool member, recesses of said pocket are formed at portions where said pillars and said side plates are joined to each other, at least a portion of said pocket surface formed on the side of said pillar with which said roller is brought into contact is formed in an arc-shaped configuration in a cross section along a retainer radial direction, ~~and~~

wherein a minimum plate width of each of said side plates at said recesses is made uniform along the retainer radial direction,

wherein a roller run out preventing portion is provided at an end portion of said pillars, and

wherein a surface of said recesses is arc-shaped when viewed from the radial direction of the retainer.

8. (currently amended): A retainer for a roller bearing comprising:

a pair of ring-shaped side plates;

a plurality of pillars arranged in a retainer revolving direction and each having end portions respectively connected to said ring-shaped side plates, wherein one of said pillars has a chamfer portion provided thereon at a boundary between said one of said pillars and either an outside or inside diameter surface of the retainer;

a roller receiving pocket defined by said ring-shaped side plates and adjacent pillars of said pillars for receiving a roller,

wherein pocket surfaces are formed on sides of said pillars and said side plates by machining with a milling tool member, recesses of said pocket are formed at portions where said pillars and said side plates are joined to each other, and at least a portion of said pocket surface formed on the side of said pillar with which said roller is brought into contact is formed into an arc-shaped configuration in a cross section along a retainer radial direction,

wherein roller run-out preventing portions are formed at end portions of said pillars in the retainer radial direction, the width of said pocket in a retainer revolving direction which is defined between adjacent roller run-out preventing portions and formed at an end thereof in the retainer radial direction is made smaller than the diameter of said roller, and end portions of each

of said run-out preventing portion in a retainer axial direction are separated from said side plates by said recesses, and

wherein a surface of said recesses is arc-shaped when viewed from the radial direction of the retainer.

9. (currently amended): A retainer for a roller bearing comprising:

a pair of ring-shaped side plates;

a plurality of pillars arranged in a retainer revolving direction and each having end portions respectively connected to said ring-shaped side plates;

a roller receiving pocket defined by said ring-shaped side plates and adjacent pillars of said pillars for receiving a roller,

wherein pocket surfaces are formed on sides of said pillars and said side plates by machining with a milling tool member, recesses of said pocket are formed at portions where said pillars and said side plates are joined to each other, at least a portion of said pocket surface formed on the side of said pillar with which said roller is brought into contact is formed into an arc-shaped configuration in a cross section along a retainer radial direction.

a roller run-out preventing portion is formed at an end portion of said pillar in the retainer radial direction,

the width of said pocket in a retainer revolving direction which is defined by adjacent roller run-out preventing portions and formed at an end thereof in the retainer radial direction is made smaller than the diameter of said roller, and

a sectional configuration of said run-out preventing portion along the retainer radial direction on the pillar side is formed into a curved line smoothly connecting to said arc-shaped configuration of said pocket surface formed on the side of said pillar and having a radius of curvature protruding toward said pocket, and

wherein a surface of the recess is arc-shaped when viewed from the radial direction of the retainer.

10-13. (canceled).

14. (withdrawn): A method of making a retainer for a rolling bearing, comprising the steps of:

forming a rolling element receiving pocket-blank for receiving a rolling element, wherein the rolling element is a roller;

defining said pocket-blank by a pair of ring-shaped side plates and a pair of pillars each having end portions which are respectively connected to said ring-shaped side plates;

finish-machining said pocket-blank with a tool member while a machining part of said tool member is inserted into said pocket-blank in a radial direction of said retainer and then translated in an axial and revolving directions of said retainer so as to form said pocket with a first pocket surface facing toward the revolving direction of said retainer, a second pocket surface facing toward the axial direction of said retainer and an escaping recess disposed between said first and second pocket surfaces;

wherein said machining part of said tool member is provided with a sectional contour which coincides with a sectional configuration of said pocket in a cross section taken along the radial direction of said retainer after the formation of said pocket is completed,

wherein said finish-machining comprises finish-machining said first pocket surface with a first tool provided on said tool member so as to form said first pocket surface on each of said pillars, and so as to form said first pocket surface into an arc-shaped configuration in a cross section along the radial direction of said retainer, and

wherein said finish-machining further comprises finish-machining said second pocket surface and said escape recess with a second tool provided in said tool member so as to form said second pocket surface on each of said ring-shaped side plates, and so as to provide a minimum plate width of said ring shaped side plates at said escaping recess which is uniform along the radial direction of said retainer.

15. (previously presented): The retainer for rolling bearings as set forth in Claim 1, wherein a length of one of the run out preventing portions is equal to or less than a roller effective length e and is more than 0.75 of the roller effective length e .

16. (previously presented): The retainer for a rolling bearing as set forth in Claim 5, wherein one of said pillars has a chamfer portion provided thereon at a boundary between said one of said pillars and either an outside or inside diameter surface of the retainer.

17. (previously presented): The retainer for a rolling bearing as set forth in Claim 7, wherein a length of one of said roller run out preventing portions is equal to or less than a roller effective length e and is more than 0.75 of the roller effective length e .

18. (previously presented): The retainer for a rolling bearing as set forth in Claim 8, wherein a length of one of said roller run out preventing portions is equal to or less than a roller effective length e and is more than 0.75 of the roller effective length e .

19. (previously presented): The retainer for a rolling bearing as set forth in Claim 9, wherein a length of one of said roller run out preventing portions is equal to or less than a roller effective length e and is more than 0.75 of the roller effective length e .

20. (previously presented): The retainer for a rolling bearing as set forth in Claim 9, wherein one of said pillars has a chamfer portion provided thereon at a boundary between said one of said pillars and either an outside or inside diameter surface of the retainer.